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RESEARCH ARTICLE

A Systematic Literature Review of Research on Negation in Academic Writing

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ARTICLE INFO	ABSTRACT
	Academic writing presents objective claims and reasoned arguments, requiring writers to manage their perspectives and alternative voices. Negation, expressing opposition, is a crucial rhetorical resource for achieving interpersonal communication goals. This systematic literature review addresses the lack of comprehensive reviews on negation in academic writing by analyzing 22 empirical studies. The studies were categorized by conceptual frameworks, research designs, data sources, and reporting practices. Findings indicate a prevalence of Appraisal Theory and in-depth textual analysis. However, research on negation remains limited, particularly across different expertise levels and disciplines. This review highlights the importance of negation in enhancing academic arguments and suggests directions for future research, emphasizing the need for integrating multiple theoretical frameworks and diverse perspectives.

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INTRODUCTION

Written academic discourse is widely recognized for being more than simply factual information; rather it functions as a dialogue that fosters the construction of knowledge through exchanging alternative views and parallel views (Du et al., 2023; Hyland, Jiang, 2022; Geng, Wharton, 2016; Hyland, 2015; McGrath, Kuteeva, 2012). Effective research writing within a discipline involves engaging readers, addressing topics of current interest, and presenting credible research findings. Authors need to recognize and use interpersonal language resources effectively when writing texts that convey their voice, establish agreement with readers, evaluate materials critically, and acknowledge different viewpoints (Jiang, Ma, 2018; Hyland, 2004). This ability is essential both in research writing and advanced academic literacy (Wu, Paltridge, 2021; Loghmani et al., 2020; Koutsantoni, 2006).

Negation, as an interpersonal language resource, is essential in academic writing (Sun, Crosthwaite, 2022a; 2022b). It represents either the opposite or the lack of something (Sinclair et al., 2017) and appears in two types: affixal (morphological) and non-affixal (clausal) negation (Tottie, 1991). Affixal negation uses negative prefixes like non-, dis-, and un- (Dahl, 2010), while clausal negation involves negating verbs or nonverbal elements, denying the entire proposition (Biber et al., 1998). This clausal negation or standard negation (Miestamo, 2005) directly expresses negation (e.g., no, not, never). By using negation, writers engage readers, create a dialogic space to negotiate interpersonal meanings,

construct academic persuasion, and present their arguments in writing (Li et al., 2023; Zolfaghari, 2023).

Previous reviews of academic writing (e.g., Pearson, Abdollahzadeh, 2023; Xie, 2020; Yang et al., 2023; Liu, Hu, 2021; Cheng, 2019) have provided insightful perspectives on the historical progression and contemporary tendencies within the realm of academic writing. These analyses have pinpointed influential scholars and seminal works, and this accumulated knowledge is especially advantageous for those who are new to the discipline. However, despite the wealth of existing reviews on various aspects of academic writing (e.g., metadiscourse, ERPP pedagogy), there is no systematic literature review on the topic of negation in academic writing so far. A systematic review on negation in academic writing can offer valuable insights for writers seeking to improve their language skills and employ effective negation strategies. It contributes to knowledge by summarizing current research, identifying gaps, and guiding future investigations, enriching our understanding of negation in academic discourse. This study seeks to address this gap by performing a systematic review of the existing research on negation within academic writing contexts. The design of the review was guided by the following research questions:

1. What theoretical or conceptual frameworks are utilized in empirical studies examining negation in academic writing?
2. What research designs and sources of data are employed in empirical studies on negation in academic writing?
3. What are the methodological features of empirical studies on the use of negation in academic writing?
   Specifically:
   a. What texts and corpora have been analyzed in the research?
   b. What statistical tests and coding procedures have been employed?

RESEARCH METHOD

This study adhered to the PRISMA guidelines (Page et al., 2021). The initial phase consisted of locating pertinent studies by employing suitable search terms across various academic databases. The search string includes "negation" OR "negation resources" OR "negation item*" OR "negation device*" OR "taxonomy of negation" OR "negative evaluation" OR "negative marker*" OR "disclaim marker*". To ensure that the studies retrieved were situated within academic contexts, a set of search terms were employed, including: "academic writing," "academic discourse," "academic genres," "academic context*," "academic text*," "research writing," "student writing," "graduate writing," "theses," "thesis," "Master," "Doctoral," "research article*," "argumentative essay*," and "persuasive writing." These terms were employed in searches across the online databases Web of Science, Scopus, and ProQuest, utilizing Boolean logic. Additionally, the search was not restricted by time to comprehensively track academic research on negation in academic writing. The final search strings are detailed in Table 1. Furthermore, a retrospective review of bibliographies was performed to locate studies missed during the initial search. This supplementary search concentrated on the latest academic publications from 2022 to 2023, as it was not feasible to scrutinize the citation lists of every study retrieved.

Table 1: Search strings in each database

Database	Search strings
Web of Science	AB= ("negation" OR "negation resources" OR "negation item*" OR "negation device*" OR "taxonomy of negation" OR "negative evaluation" OR "negative marker*" OR "disclaim marker*") AND AB=("academic writing" OR "academic discourse" OR "academic genres" OR "academic context*" OR "academic text*" OR "research writing" OR "student writing" OR "graduate writing" OR "theses" OR "thesis" OR

	"Master" OR "Doctoral" OR "research article*" OR "argumentative essay*" OR "persuasive writing")
Scopus	TITLE-ABS-KEY ("negation") OR TITLE-ABS-KEY ("negation resources") OR TITLE-ABS-KEY ("negation item*") OR TITLE-ABS-KEY ("negation device*") OR TITLE-ABS-KEY ("taxonomy of negation") OR TITLE-ABS-KEY ("negative evaluation") OR TITLE-ABS-KEY ("negative marker*") OR TITLE-ABS-KEY ("disclaim marker*") AND TITLE-ABS-KEY ("academic writing") OR TITLE-ABS-KEY ("academic discourse") OR TITLE-ABS-KEY ("academic genres") OR TITLE-ABS-KEY ("academic context*") OR TITLE-ABS-KEY ("theses") OR TITLE-ABS-KEY ("thesis") OR TITLE-ABS-KEY ("Master") OR TITLE-ABS-KEY ("Doctoral") OR TITLE-ABS-KEY ("research article*") OR TITLE-ABS-KEY ("argumentative essay*") OR TITLE-ABS-KEY ("persuasive writing")
ProQuest	Summary ("negation" OR "negation resources" OR "negation item*" OR "negation device*" OR "taxonomy of negation" OR "negative evaluation" OR "negative marker*" OR "disclaim marker*") AND summary ("academic writing" OR "academic discourse" OR "academic genres" OR "academic context*" OR "academic text*" OR "research writing" OR "student writing" OR "graduate writing" OR "theses" OR "thesis" OR "Master" OR "Doctoral" OR "research article*" OR "argumentative essay*" OR "persuasive writing")

In total, 434 studies were gathered by employing search terms and tracing back through citations. Adhering to the PRISMA guidelines, the titles and abstracts were assessed for their relevance to the research, resulting in the exclusion of 335 records (refer to Figure 1). Study selection was based on the following four inclusion criteria. First, studies were accessible in English. This standard is set because English is widely recognized as the lingua franca of academic publishing, which allows the review to include the most widely disseminated and impactful research, while also minimizing the risks of misinterpretation due to language barriers. Second, studies included in the review were required to analyze negation as a category within academic contexts, even if negation was not their primary focus. This criterion was crucial to ensure comprehensive coverage, capturing a broad scope of perspectives on the usage of negation and ensured that all selected studies provided relevant data. Third, studies eligible for inclusion were those that are empirical, revealing or generating knowledge grounded in experience through structured research. This ensures that the review is founded on concrete, data-driven findings, essential for establishing both the reliability and validity of the literature review. Fourth, studies researched negation within academic writing. This ensures that all selected studies are directly relevant to the central topic. To create a more representative sample and mitigate potential publication bias favoring significant results, both published (e.g., peer-reviewed journal articles, books) and unpublished studies (e.g., dissertations and theses) were included. If the results of a dissertation were published in a journal article, only the results in the journal article were used. Following the screening and filtering process, 22 studies that fulfilled the established selection criteria were incorporated into the systematic review.

This study, similar to other systematic reviews that employ quantitative methodology (e.g., Pearson, Abdollahzadeh, 2023; Xie, 2020), used quantitative research data collection and synthesis. It relied on a deductive coding framework and methodological characteristics of empirical research on negation in academic writing. A coding sheet was created by determining relevant values, classifications and variables for analysis, drawing on other academic discourse analysis reviews (e.g., Pearson, Abdollahzadeh, 2023; Xie, 2020). A preliminary scheme was piloted on 10 studies. The scheme was then revised to incorporate additional variables that emerged during the piloting phase but were not initially identified. Ultimately the scheme focused on six key categories, aligned with the research questions of the study: theoretical/conceptual framework considerations (for RQ1); research design, data sources, and analytical tools (for RQ2); textual/writers and reporting practices

(for RQ3). Each category undergoes scrutiny across a range of variables, which include categorical values like types of empirical studies and analytical software used. The findings will present frequencies and percentages to reveal mainstream practices, unusual trends, and gaps needing attention.
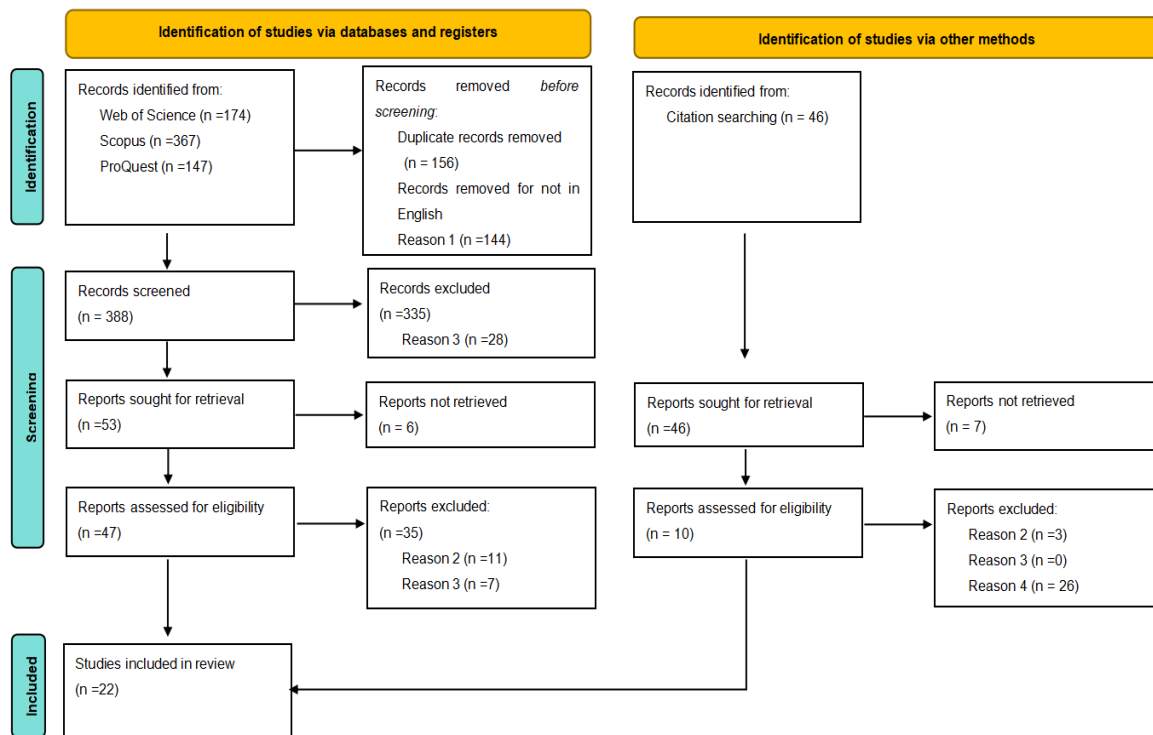

Figure 1: PRISMA diagram

RESULTS AND DISCUSSION

Overview of the reviewed studies

Table 2 provides a summary of the studies included in the review. Notably, approximately 65% of the studies retrieved were published after 2014, with 36.36% emerging between 2022 and 2023. This trend indicates an increasing focus on research into negation in academic writing. However, the total number of papers on this topic remains relatively limited, which reinforces previous suggestions that negation is an overlooked rhetorical element in the literature of EAP (Swales, 2019; Jiang, Hyland, 2022, 2023). Most of these studies were published in journals (81.82%), with a noteworthy 60% appearing in high-quality journals. Among these, two publications significantly contributed to the use of negation: Journal of English for Academic Purposes, constituting 31.82% and English for Specific Purposes, comprising 22.73%. The specialized focus of these journals on linguistic phenomena within academic contexts suggests that the exploration of negation primarily centers around its linguistic features (e.g., forms and semantic analysis). Furthermore, it highlights the journals' emphasis on the practical applications of negation in language teaching and learning. Therefore, this growing interest in the study of negation in high-quality journals can be attributed to the novelty of negation as a relatively unexplored topic in academic writing research makes it appealing to these journals.

Table 2: Characteristics of the reviewed studies.

Variable	Value	N	%
Decade of publication	2014–2023	14	63.64%
	2004–2013	8	36.36%
Type of publication	Journal article	18	81.82%
	Book chapter	4	18.18%
Publication sources	Journal of English for Academic Purposes	7	31.82%
	English for Specific Purposes	5	22.73%
	Written Communication	1	4.55%
	Open Linguistics	1	4.55%
	BMC Bioinformatics	1	4.55%
	Brno Studies in English	1	4.55%
	Russian Language Studies	1	4.55%

THEORETICAL OR CONCEPTUAL FRAMEWORK

Table 3 presents studies where negation is the focus in the analysis of academic writing (N=8). The theoretical frameworks presented in Table 3 reveal a consistent application of Appraisal Theory (Martin, White, 2005), such as in research by Webber (2004), Zolfaghari (2023) and Sun and Crosthwaite (2022a, 2022b). Developed by Martin and White in 2005, Appraisal Theory posits a conceptualization of language as device for constructing meaning, which includes the ideational, interpersonal, and textual aspects that are all responsive to the context, as articulated by Halliday and Matthiessen in 2004. This framework treats language not just as a conveyor of content but as an active participant in shaping the reader's interpretation in a way that is sensitive to the situational nuances. In the reviewed studies, the application of Appraisal Theory to investigate the interpersonal meanings of negation in academic texts is notable. The prevalence of this theory underscores its significance in assessing the role of negation as an interpersonal communicative tool for expressing stance and engagement within academic texts. The focus on semantic analysis of negation in these studies highlights the theory's capacity to dissect the intricacies of academic rhetoric.

Another line of research grounded in Jiang and Hyland's (2022) interpersonal framework for the use of negation (N=3). This model was explored under the concept of metadiscourse, as described by Jiang and Hyland (2022). In this framework, negation serves both interactive functions and interactional functions (Jiang, Hyland, 2022). Jiang and Hyland (2022, 2003) employ this model to investigate negation in research abstracts, suggesting a deliberate and strategic use of negation shaped by disciplinary norms. Li et al. (2023) also adopted this model to compare how negation is used by native and non-native English speakers in academic writing, demonstrating negation constructs meaning and writer-reader relationships. Together, these frameworks aid in attaining a thorough comprehension of negation within the realm of academic writing. They highlight the importance of negation in influencing reader interpretation and its role in fulfilling various communicative purposes within academic contexts.

Table 3: Negation as the focus in academic writing analysis

	Studies	Theoretical/conceptual framework (if any)	Major findings/Conclusion of negation in academic writing
1	Webber (2004)	Engagement of Appraisal Theory (Martin, White, 2005)	Negation's role in expressing alignment or distance with the reader in linguistics papers
2	Laso et al. (2013)	Phraseological conventions of discourse communities	Patterns of adjectives combined with negation for hedging, consequence, and contrast
3	Nawaz et al. (2013)	Not provided	Proposing a novel machine learning framework for detecting negated events in biomedical text mining
4	Jiang and Hyland (2022)	Metadiscourse (Hyland,2005) / Interpersonal model of negation	Negation is not used randomly but is a deliberate choice by writers, influenced by disciplinary practices and possibly evolving demands for clarity and communicative effectiveness in academic writing
5	Sun and Crosthwaite (2022a)	Appraisal Theory (Martin, White, 2005) + Webber's (2004) elaboration of negation	Negation in Ph.D. thesis limitations displays general and field-specific trends: soft-applied prefers varied forms like "not" and "no," while hard disciplines are positioned between soft-applied and soft-pure disciplines, reflecting varying knowledge structures and approaches to thesis limitations
6	Sun and Crosthwaite (2022b)	Appraisal Theory (Martin, White, 2005) + CARS model (Swales, 1990)	Disalignment emerges as the most prevalent negation subtype in Ph.D. thesis introductions, with "not" and "no" as frequent indicators and negation is a crucial element in intensifying authorial stance
7	Li et al. (2023)	Interpersonal model of negation (Jiang, Hyland, 2022)	Differential use of negation in thesis sections, with L1 exhibiting higher frequency and interactive/interactional dimensions, contrasted by L2's underuse and booster preference
8	Zolfaghari (2023)	Appraisal Theory (Martin, White, 2005) + Sun and Crosthwaite's (2022a) exploration of negation	Disciplinary-specific use of negation suggests that awareness of rhetorical convention is crucial for academic writers to effectively express their authorial voice and align with disciplinary expectations

Table 4 features studies that negation is one category being analyzed within academic writing (N=14). The Appraisal Theory (Martin, White, 2005), is also widely applied in various studies (e.g., Lam, Crosthwaite, 2018; Xu, Nesi, 2019; Loghmani et al., 2020; Fryer, 2013). In these studies, negation was discussed as an auxiliary element that aids in describing engagement, which is the

higher-level interpersonal language resource in Martin and White's appraisal system (2005). Geng and Wharton's (2016) research revealed no substantial differences in the use of negation between Chinese and native English-speaking speakers in the discussion sections of doctoral theses in Applied Linguistics. However, diverging from this finding, Li et al. (2023), utilizing the interpersonal model of negation introduced by Jiang and Hyland (2022), observed Ph.D. students with English as their first language are more likely to use a higher frequency of negative markers in their theses compared to Chinese students in the same academic field. They argued that the difference may attribute to differences in academic writing experience. Integrating findings from previous studies, it appears that academic experience (e.g., novice and expert) are more significant determinants in influencing the use of negation in academic writing, rather than cultural or linguistic background. Therefore, further research is necessary to verify and expand upon these current findings.

Table 4: Negation as a part in the analysis of academic writing

	Studies	Theoretical/conceptual framework (if any)	Major findings/Conclusion of negation in academic writing
1	Giannoni (2009)	Not provided	Significant genre-based variations in evaluative strategies, with a marked preference for positive over negative evaluations
2	Chang and Schleppegrell (2011)	Engagement of Appraisal Theory (Martin, White, 2005)+Swales' moves (Swales, 1990; 2004)	The selection of grammatical structures and lexical items within engagement resources helps to enable targeted rhetorical strategies and to achieve particular discursive impacts in the introductions, highlighting the co-articulation of linguistic resources in achieving and reinforcing meanings
3	Lorés-Sanz (2012)	Evaluative behavior (Thetela ,1997; Shaw, 2004, 2009)	British and Spanish history book reviews commonly employ positive evaluation; however, Spanish reviews rarely feature negative critiques, focusing mainly on the book rather than the author, unlike British reviews which critique both equally
4	de Waard and Pander Maat (2012)	Discourse segment type analysis	The importance of verb tense varies among different segments; problem segments are less influenced by tense and more by specific markers like negation elements
5	Fryer (2013)	Heteroglossic engagement of Appraisal Theory (Martin, White, 2005)	In the discussion sections, there appears to be a tendency for the likelihood of dialogic contraction to decrease, while the likelihood of dialogic expansion increases as the text progresses.
6	Bruce (2014)	Social genre/cognitive genre model (Bruce, 2008)	Affirmative/negative propositions imply cautious criticism of others' work; negative/affirmative implies support for own research.

7	Geng and Wharton (2016)	Engagement within Appraisal Theory (Martin, White, 2005)	No significant differences in language selections within doctoral thesis discussions between Chinese and English writers, suggesting first language doesn't influence these choices in the studied context
8	Samraj (2016)	"Text-first" analysis (Askehave, Swales, 2001)	Reviews for "major revision" emphasize recommendation units, while "reject" reviews focus on negative evaluation
9	Lam and Crosthwaite (2018)	Appraisal Theory (Martin, White, 2005)	Writers with English as their first language demonstrated a heightened dependence on engagement resources, whereas English as a second language writers exhibited a greater utilization of resources that convey negative attitudes.
10	Xu and Nesi (2019)	Appraisal Theory (Martin, White, 2005)	No notable disparities were observed in the utilization of negation resources between British and Chinese writers.
11	Loghmani et al. (2020)	Engagement of Appraisal Theory (Martin, White, 2005)	Native English-speaking TEFL Ph.D. students favor contractive over expansive dialogic resources in their dissertations to reduce potential challenge or rejection.
12	Du et al. (2023)	Appraisal Theory (Martin, White, 2005) +Metadiscourse +Swales' moves (Swales, 1990; 2004)	Writers in the field of engineering articulate their critical perspectives in a rather straightforward manner, employing attitudinal markers that carry potent negative connotations and sparingly incorporating techniques aimed at mitigation or amplification.
13	Boginskaya (2023)	Hedge	Hedges serve to mitigate criticism and reduce the intensity of negative evaluations in Russian thesis reviews
14	Jiang and Hyland (2023)	Interpersonal model of negation (Jiang, Hyland, 2022)	Negation in research abstracts has decreased over the last 30 years, particularly in aspects of boosting and consequence, while sociologists increasingly use it to establish space for new contributions.

Overall, studies focusing on negation are relatively scarce (36.36%) compared with the studies of negation as a part of analysis (63.64%), and those examining negation typically adopt appraisal theory (Martin, White, 2005) to analyze its functional role in academic writing. This theory is favored partly because it allows for a deeper semantic analysis of negation, highlighting its evaluative and interpersonal functions in academic writing. One possible explanation for this preference also could be that adhering to this widely accepted theory may enhance the credibility of the analysis, thereby increasing the likelihood of manuscript acceptance in peer review. Previous research has rarely integrated multiple theories to examine the function of negation in academic writing, with Only Du et al. (2023) have integrated Hyland's (2005) metadiscourse theory, Martin and White's (2005)

framework, and Swales' (1990) CARS model in their research. In their study, negation was only a part of the analysis, and it was utilized to illustrate the evaluative behavior of engineering writers in research article introductions. Future studies could integrate the strengths of different theories to better understand the interpersonal communication of negation in academic writing and provide insights for teaching and learning negation in academic contexts.

Research designs and data sources

Study types

By conducting a manual examination, the collected studies were scrutinized, evaluated, and categorized into two main research categories according to their objectives and methodologies, as depicted in Table 5. Synchronic studies, the majority at 90.91%, concentrate on the usage of negation at a specific point in time. These studies are subdivided into non-comparative and comparative types. Non-comparative studies, making up half of the total research, do not compare different groups or contexts (e.g., Samraj, 2016; Du et al., 2023). Comparative studies, less common, investigate the disparities in the application of negation throughout various academic domains and cultural contexts, offering insights into varying academic discourse conventions. Table 6 provides the distribution of writer and textual elements of contrast within contrastive studies on negation in academic writing, some of which belong to multiple groups. The most common point of comparison is between L1 English writers and L2 English writers (Chinese). This focus is likely driven by the global dominance of English in academia (MacKenzie, 2015) and the growing need to understand how linguistic backgrounds affect academic communication in the increasingly globalized research landscape (Yin et al.,2023; Díez-Bedmar, Perez-Paredes, 2020). Additionally, the comparative studies consider different disciplines (both soft and hard sciences) or various sections of academic texts (IMRD), though these receive relatively less focus. This indicates recognition of their importance and points to potential areas for more in-depth investigation in future studies.

Comparative studies (40.91%) and Diachronic studies (9.09%) are less common, which is possibly due to the challenges of analyzing a more substantial volume of text, particularly when comparing the evolution of negation use over time and/or across different fields and/or cultural backgrounds. This increases the complexity of the research and demands more time and resources for data collection and analysis. Another possible explanation might be the word count restrictions set by academic journal publications, which may prevent a comprehensive and detailed analysis of a wide array of features within a single article. Future research might consider broader avenues, such as doctoral theses or books. These longer formats can facilitate a more in-depth examination of multiple variables influencing the use of negation in academic writing.

Table 5: Types of empirical studies on negation in academic writing

Category	Sub-category	Studies	N	%
Synchronic studies of	(A) Non-comparative studies	Chang and Schleppegrell (2011),	11	50%
authors' negation use in academic writing		Samraj (2016), Du et al. (2023)		
	(B) Comparative studies	Geng and Wharton (2016),	9	40.91%
		Lam and Crosthwaite (2018),		
		Zolfaghari (2023)		
Diachronic studies of		Jiang and Hyland (2022),	2	9.09%

Authors' negation use in academic writing			Jiang and Hyland (2023)		

Table 6: Elements of contrast involving writer and text in contrastive studies

Writer values			Textual values		
	N	%		N	%
L1 English writers and L2 English writers (Chinese)	4	18.18%	Discipline (soft, hard)	4	18.18%
L1 (English, Spanish)	1	4.55%	Text section (IMRD)	2	9.09%
			Academic review genres (expert reviews, book reviews, blurbs, and publishers' descriptions)	1	4.55%

Data sources and retrieval

Table 7 shows that the main data source for research on negation in academic settings is derived from corpora of academic texts. About 95.45% of the studies use corpora of academic texts (e.g., Sun, Crosthwaite, 2022a, 2022b; Du et al. 2023; Loghmani et al. 2020), while only around 4.55% use questionnaires or surveys. The difference suggests a preference for pre-existing text collections over primary data collection via surveys, supporting the findings of bibliometric research for examining linguistic features in academic writing (e.g., Pearson, Abdollahzadeh, 2023; Xie, 2020). Additionally, there is a diversity in the software tools used for corpus analysis. The UAM Corpus Tool is used in 27.27% of studies (e.g., Sun, Crosthwaite, 2022a,2022b), encompassing the manual annotation in context, and AntConc is used in 13.64% (e.g., Jiang, Hyland, 2022, 2023). The widespread use of these two software tools indicates different choices and reflects the specific features of these tools. Another reason may be attributed to their free availability.

Additionally, table 7 shows different ways corpus software tools are used. The main use is to help with manual coding of negation functions, at 31.82%. The reliance on manual annotation suggests that, despite the availability of machine learning tools, the accuracy and depth provided by manual analysis are crucial, especially for accuracy or complex linguistic data where context is crucial. (Xie, 2020; Gray, Biber 2012; Hyland, 2005). This in-depth textual analysis provides a deep understanding and awareness of the context that automated tools are still trying to research. The intelligent identification of negative markers and identifying the types and occurrences of negation markers from a pre-established list, with each type accounting for 13.64%, indicate a growing trend towards incorporating advanced technological methods in research methodologies (e.g., Sun, Crosthwaite, 2022; Li et al., 2023). The intelligent features of software facilitate the efficiency of manual tasks such as text cleansing, categorization, annotation, and statistical analysis. This mirrors an evolving research environment where the development of automated tools and algorithms is increasingly influencing corpus analysis in academic writing. Therefore, future studies in academic discourse analysis are likely to be characterized by manual analysis with software assistance. This integration is expected to yield richer insights and a deeper understanding of language phenomena.

Table 7: Data sources and analysis tools

Variable	Value	N	%
Data sources	Corpora	21	95.45%

	Questionnaires/surveys	1	4.55%
Software tools used	UAM CorpusTool	6	27.27%
	AntConc	3	13.64%
	Python	2	9.09%
	NVivo	1	4.55%
	Machine learning algorithms	1	4.55%
The application of corpus software	Manually annotate negation functions	7	31.82%
	Intelligently identify negative markers	3	13.64%
	Identify types and frequencies of negation markers from a pre-established list	3	13.64%

Text and corpora features

Table 8 illustrates the distribution of academic disciplines in studies centered on negation in academic writing. Applied linguistics is the most commonly examined discipline, accounting for 13.64% of the studies, possibly due to the researchers being more familiar with its discourse practices. Moreover, applied linguistics plays a key role in the trend toward internationalization in higher education (Wu, Paltridge, 2021). The biological and social sciences, each accounting for 9.09% of single-discipline studies, reflect the interest in understanding how negation functions in different fields of academic discourse.

Based on the Becher and Trowler (2001) taxonomy, cross-disciplinary studies in academic writing are divided into 'hard' and 'soft' categories. There have been four studies (Jiang, Hyland, 2022, 2023; Zolfaghari, 2023; Sun, Crosthwaite, 2022a) focusing on disciplinary contrasts in the use of negation. These studies, particularly Jiang and Hyland (2022, 2023), used the same corpus (research article abstracts) to investigate negation across different disciplines. However, cross-disciplinary studies are limited and recently published (2022-2023) on this topic of negation, with differences in the number of disciplines studied, types of texts analyzed (e.g., Ph.D. thesis limitations sections, journal abstracts, full texts), and the rationale for selecting these disciplines. Consequently, it's currently difficult to make generalizations about the use of negation across various disciplines. The reasons for studying negation from various disciplinary perspectives are diverse, potentially including influences from funding bodies, research trends, institutional demands, and the growing appreciation for the value of interdisciplinary research in addressing complex linguistic issues. Future research in this area could benefit from adopting a broader focus on different populations and academic fields, enhancing the current understanding of negation in academic writing and the factors that influence its use.

Table 8: Disciplinary contexts

Variable	Value	N	%
Single-discipline studies	Applied linguistics	3	13.64%
	Biological sciences	2	9.09%
	Social sciences	2	9.09%
	Medicine	1	4.55%
	Engineering	1	4.55%
	Linguistics	1	4.55%

	TEFL (Teaching English as a Foreign Language)	1	4.55%
	History	1	4.55%
	Total	12	54.55%
Interdisciplinary studies	Hard and soft	4	18.18%

Table 9 provides an analysis of textual registers in studies related to negation in academic writing. The articles analyzed typically are published in top-ranked journal. The introductions (13.64%) and abstracts (9.09%) of research articles are given more focus, emphasizing their importance in scholarly communication. These sections are critical for they allow authors to effectively present their main arguments and demonstrate the significance of their work to the academic community. The only comparative study is a cross-sectional analysis of research articles conducted by Fryer (2013), focusing on the variation in the deployment of engagement strategies within medical research articles structured. The core of this study was the heteroglossic engagement of appraisal theory (Martin, White, 2005), with negation not being the central focus. Future research could center on negation in academic research article writing, examining it from different perspectives, such as through cross-sectional analysis or by comparing different sections like introductions and conclusions. Despite negation being a common element throughout all parts of a research article, each serving its own rhetorical and communicative purpose, there is a lack of research on how authors employ negation in different sections to achieve their rhetorical goals.

Theses, particularly Ph.D. theses (22.73%), also constitute an important register, with cross-sectional analysis, introductions, discussions, limitations, and thesis reviews making up a notable portion of the research (e.g., Li et al., 2023; Sun, Crosthwaite, 2022a,2022b; Boginskaya, 2023). This suggests an academic interest in the rhetorical structure and strategies employed in high-stakes academic writing (e.g., Paltridge, Starfield, 2020; Geng, Wharton, 2016; Kwan, 2006). The reasons for this distribution of focus likely stem from the academic and pedagogical significance of these registers. Research articles and theses represent the culmination of scholarly work and are key to academic advancement, while the teaching of effective writing skills in these genres is central to the education of novice scholars. Analyzing these texts offers valuable insights into the use of negation as a rhetorical tool, which is vital for academic persuasion and engagement within discourse communities. The examination of book reviews (9.09%), journal manuscript reviews (4.55%), and argumentative essays (4.55%) showcases the wide range of academic genres being studied in relation to negation. This variety underscores the importance of persuasive and critical abilities, particularly through the effective use of negative linguistic devices, in diverse forms of academic writing. For future research, expanding the focus to include a broader array of academic texts and registers could provide deeper understanding of negation usage and enhance the teaching and comprehension of effective academic writing.

Table 9: Textual registers

Value	N	%
Research article		
Research article as a whole	2	9.09%
Cross-sectional analysis	1	4.55%
Abstract	2	9.09%
Introduction	3	13.64%
Conclusion	1	4.55%

Thesis		
Cross-sectional analysis (PHD thesis)	1	4.55%
Introduction (PHD thesis)	1	4.55%
Discussion (PHD thesis)	2	9.09%
Limitation (PHD thesis)	1	4.55%
Thesis reviews	1	4.55%
Book review	2	9.09%
Journal manuscript review	1	4.55%
Argumentative essay	1	4.55%

Table 10 shows the number of texts analyzed and the corpus compilation period of studies on negation in academic writing. Most studies (59.09%) examined fewer than 100 texts, indicating an in-depth approach, allowing for detailed analysis of each negation instance (e.g., Li et al., 2023; Bruce, 2014; Webber, 2004;). Approximately 60% of studies covered 10 years, possibly due to practical limitations in gathering more extensive data. This may also contribute to the widespread adoption of in-depth textual analysis in most studies, signifying that a relatively focused small corpus is manageable for achieving a comprehensive examination. However, a portion of the studies did not report specific values for text quantity (18.18%) and the period of data collection (27.28%). This omission could affect both replicability and the transparency of research quality. It also poses challenges for those attempting to make accurate cross-study comparisons and track the use of negation in academic writing over time. Future research could conduct a more balanced approach that incorporates both qualitative and quantitative methods. This could involve the use of medium-sized corpora that are large enough to provide generalizable results but still manageable for detailed qualitative analysis. Additionally, there is a need for more transparency in reporting corpus design features, which could improve replicability and the robustness of research. In conclusion, the corpus design features reflected in Table 10 underscore the diversity of research design in studying negation in academic writing. They highlight the methodological choices researchers must make, which are influenced by their research questions and the practicalities of corpus compilation and analysis.

Table 10: Features of corpus design

Variable	Value	N	%
Quantity of texts	1-100		
	4	1	4.55%
	8	1	4.55%
	10	1	4.55%
	12	1	4.55%
	20	1	4.55%
	23	1	4.55%
	30	2	9.09%
	50	1	4.55%
	60	2	9.09%
	90	1	4.55%

	100	1	4.55%
	Total	13	59.09%
	100+		
	120	2	9.09%
	360	1	4.55%
	6000	2	9.09%
	Not reported	4	18.18%
Corpus time frame (in years)	1	3	13.64%
	3	1	4.55%
	4	3	13.64%
	6	2	9.09%
	8	3	13.64%
	10	1	4.55%
	20	1	4.55%
	30	2	9.09%
	Not reported	6	27.27%

Statistical analyses and coding procedures

Table 11 provides a comprehensive overview of the reporting practices and statistical analyses adopted in the examined studies. Notably, a significant portion, 90.91%, of these studies have employed descriptive statistics, typically involving the calculation of negation frequencies and their distribution across selected categories (e.g., Samraj, 2016; Loghmani et al., 2020; Bruce, 2014). The use of inferential statistics (45.45%), however, is less common. Within this domain, the log-likelihood test is the predominant test employed (18.18%), and it is used to assess the potential significance of variations in the distribution of negation markers across different bodies of text (e.g., Jiang, Hyland, 2022, 2023; Li et al., 2023). Non-parametric tests, including the Mann-Whitney U test and the Kruskal-Wallis test, are frequently employed (18.18%) due to the often small sample sizes or non-normal distribution of linguistic data (e.g., Sun, Crosthwaite, 2022; Geng, Wharton, 2016). Parametric tests, t-test, and ANOVA, both at 9.09% of studies, are particularly relevant in comparisons across multiple groups (Lam, Crosthwaite, 2018).

Table 11 reveals that most studies normalize the frequency of negation per 1,000 words (59.09%) to facilitate comparison across studies with varying text lengths (e.g., Lam, Crosthwaite, 2018; Sun, Crosthwaite, 2022a,2022b). However, some studies normalize per 10,000 words, suggesting an approach suited to larger text volumes or when texts have substantial length variability (e.g., Li et al. 2023; Giannoni, 2009). Table 11 also summarizes that all studies checked the function of negation within the surrounding context. Regarding coding reliability, 59.09% of studies detailed their coding methodology. A majority employed double coding of all items (27.27%) and inter-rater reliability analysis conducted on a subset of items (18.18%). Fewer studies used delayed intra-rater analysis (9.09%), external reviewer (4.55%), and iterative cross-checking (4.55%). Detailing this information is a common practice in negation research, aiding in the transparency of the researchers' analytical procedures.

Table 11: Statistical methods and reporting practices

Variable	Value	N	%
Reported analytical tests	Descriptive statistics	20	90.91%
	Inferential statistics	10	45.45%
	Log likelihood test	4	18.18%
	Mann-Whitney U	3	13.64%
	T-test	2	9.09%
	ANOVA	2	9.09%
	Chi-square	1	4.55%
	Kruskal Wallis	1	4.55%
Normalised frequency	Normalized per 1,000 words	13	59.09%
	Normalized per 10,000 words	2	9.09%
	Not reported	7	31.82%
Negation function examined within co-text?	Yes	22	100.00%
	Not reported	0	0.00%
Reported coding reliability?	Yes	13	59.09%
	Double coding of all items	6	27.27%
	Inter-rater reliability analysis conducted on a subset of items	4	18.18%
	Delayed intra-rater analysis	2	9.09%
	External reviewer	1	4.55%
	Iterative cross-checking	1	4.55%
	No	9	40.91%

Previous systematic literature reviews on academic writing have synthesized studies from a range of analytical perspectives. The first strand, employing bibliometric analysis, focuses on journals of academic discourse to map the field's evolution and identify major research clusters (e.g., Liu, Hu, 2021; Yang et al., 2023). The second strand explores the teaching and learning of academic English writing. James (2014) discusses the complexity of learning transfer across contexts. Furthermore, Cumming et al., (2020) review the specificity of English for Research Publication Purposes pedagogy. The third strand examines authorial evaluation in academic writing. For example, Pearson and Abdollahzadeh (2023) systematically reviewed the dominant framework of metadiscourse, while Xie (2020) analyzed authorial evaluation from a methodological perspective, discussing the strengths and weaknesses of various approaches. This review extends the analytical perspective of previous reviews in academic writing by focusing on a fine-grained analysis of interpersonal discourse resources for presenting authorial evaluation, specifically through the lens of negation. By combining quantitative analysis with qualitative interpretation, this study uncovers the complexity and dynamic aspects of negation in academic context.

CONCLUSION

This systematic literature review analyzed 22 empirical studies on negation in academic writing, revealing a notable increase in publications on this topic within the last two years. The review identified that Appraisal Theory, particularly Martin and White's framework (2005), is predominantly employed to investigate negation, highlighting its critical role in expressing interpersonal meanings. Despite the prevalence of non-comparative studies and corpus-assisted discourse analysis, the findings underscore a significant gap in comparative studies and the integration of diverse theoretical perspectives.

The lack of consensus across the reviewed studies indicates a need for more comprehensive research. Future studies should focus on comparative analyses across different disciplines, levels of expertise, and sections of academic texts to enhance the generalizability of findings. Additionally, integrating multiple theoretical frameworks could provide a richer understanding of negation's role in academic writing.

Limitations of this review include the reliance on studies published in English, which may underrepresent findings in other languages. Expanding future research to include non-English publications could provide a more global perspective on negation in academic writing. Overall, this review emphasizes the importance of negation as a rhetorical device and calls for further research to explore its multifaceted role in academic discourse.

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